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EXAMINER	
PHU, PHUONG M	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.**	**Applicant(s)**	
	10/750,587	SADOWSKY ET AL.	
	Examiner	**Art Unit**	
	Phuong Phu	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12,14-17 and 19-30* is/are rejected.

7)☒ Claim(s) *13 and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/29/03,4/25/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-12, 14-17 and 19-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Walton et al (2002/0154705).

-Regarding claim 1, Walton et al discloses a transmitter (see figure 3) comprising:

a parser (included in (320)) to parse a block "block" of bits representing an orthogonal frequency division multiplexed symbol into groups of separate/orthogonal "sub-channels" each conveying a potentially different number of bits (see [0099-0101]), (the groups of separate/orthogonal sub-channels considered here equivalent with the limitation "groups of a variable number of coded bits");

subcarrier modulators (included in (320)) to individually modulate the groups on orthogonal frequency division multiplexed subcarriers "sub-channels", by using a particular modulation schemes (e.g., M-PSK or M-QAM) associated with the corresponding "sub-channels", in accordance with spatial-frequency subcarrier modulation assignments to generate symbol-modulated subcarriers "modulation symbol vectors" (V_1,.., V_{NT}) (see [0101-0104]); and

IFFT circuitry (320a,...,320t) to generate time domain waveforms from the symbol-modulated subcarriers for subsequent RF transmission over a plurality of spatial channels each via a respective transmit antenna (116a,..., or 116t) (see [0150]).

-Regarding claim 2, Walton et al discloses that the time domain waveforms together comprise the orthogonal frequency division multiplexed symbol "OFDM symbol" (see 0105]), and wherein each orthogonal frequency division multiplexed subcarrier "sub-channel" inherently has a null at substantially a center frequency of the other subcarriers to achieve substantial orthogonality between the subcarriers (since the subcarriers "sub-channels" are separate sub-channels (see figure 2)).

-Regarding claim 3, Walton et al discloses that one of a plurality of spatially diverse antennas (116a,..., or 116t) is associated with a corresponding one of the spatial channels to individually transmit one of the time domain waveforms resulting from an IFFT performed on the symbol-modulated subcarriers (see figure 3), wherein the spatial channels are non-orthogonal spatial channels (due sub-channel combinations by combiner (334) provided to each spatial channel (see col. [0101-0104])) and wherein the spatial channels inherently might have at least slightly different multipath characteristics since antenna directivities of the corresponding spatial channels might be different (see [0033]) and/or subchannels allocations on the corresponding spatial channels might be different (see [0099, 0112]) , and wherein the variable number of coded bits of each group is based on a subcarrier modulation assignment for a corresponding one of the orthogonal frequency division multiplexed subcarriers and a corresponding one of the spatial channels (see [0047, 0101, 0110-0112]).

-Regarding claim 4, Walton et al discloses that data can be transmitted on one or more sub-channels, from one or more antennas at one or more time periods, and the allocated subchannels might be associated with the same antenna or with different antenna (see [0055]). Therefore, it can be said here that Walton et al invention is capable of comprising a single

antenna for subsequent RF transmission over the spatial channels, wherein the antenna is inherently includes or associates with a beamformer to perform beamforming on the time-domain waveforms for the wireless RF transmission of the time-domain waveforms, or namely it can be said that Walton et al teaches the limitation "a beamformer to perform beamforming on the time-domain waveforms for subsequent RF transmission over the spatial channels with a single antenna".

-Regarding claim 5, Walton et al discloses that : the subcarrier modulators comprise subcarrier modulation circuitry (inherently included) to individually modulate each orthogonal frequency division multiplexed subcarrier "sub-channel" in associated with a particular modulation scheme (see [0101]); and the IFFT circuitry comprises IFFT circuitry associated with each of the spatial channels to individually generate differing time domain waveforms for the orthogonal frequency division multiplexed subcarriers based on modulated symbols provided by the subcarrier modulators (see [0101-0105]).

-Regarding claim 6, Walton et al discloses RF circuitry (324a,...,324t) (see figure 3) associated with each of the spatial channels, the RF circuitry to RF modulate the time domain waveforms provided by the IFFT circuitry for transmission over an associated one of the spatial channels (see [0106]).

-Regarding claim 7, Walton et al discloses that the spatial-frequency subcarrier modulation assignments comprise a modulation assignment for each orthogonal frequency division multiplexed subcarrier for each of the spatial channel (see [0074]).

-Regarding claim 8, Walton et al discloses that the parser is a spatial-frequency parser to parse a block of bits, e.g., ($X_{i,1}$), of a variable size into spatial-frequency groups of bits (outputted

from (430a)), each spatial-frequency group being associated with a spatial component and a frequency component of the orthogonal frequency division multiplexed symbol, the spatial component being associated with one of the spatial channels, the frequency component being associated with one of the orthogonal frequency division multiplexed subcarriers (see figure 4a, [0109-0111]).

-Regarding claim 9, Walton et al discloses that the spatial-frequency subcarrier modulation assignments are provided by a feedback from a receiving station based on channel characteristics "CSI" for each of the orthogonal frequency division multiplexed subcarriers for each of the spatial channels, and wherein the channel characteristics comprise a signal to noise and interference ratio (SINR) "C/I" measured by the receiving station for the spatial channels (see [0059-0074]).

-Regarding claim 10, Walton et al discloses that the number of groups is equal to a number of the spatial channels multiplied by a number ("$L.N_T$") of the orthogonal frequency division multiplexed subcarriers (see [0107]).

-Regarding claim 11, Walton et al discloses that the variable number of coded bits of a group comprises between zero and ten bits, e.g., "4 bits" (see [0101]), and wherein the orthogonal frequency division multiplexed subcarriers comprise N subcarriers "sub-channels", (N= "L") (see [0102]), wherein the plurality of spatial channels comprises M spatial channels (M="N_T") (see [0104]), and wherein the subcarrier modulators comprise individual subcarrier modulation circuitry for each of subcarriers, the individual subcarrier modulation circuitry to individually modulate a group of bits for each spatial channel (see [0101]), and wherein the

parser provides N.times.M (= "L.N_T") groups of bits, where N and M are both positive integers less than 100 (see figure 3, [0107]).

-Regarding claim 12, Walton et al discloses that the individual subcarrier modulation assignments comprises, e.g., "16_QAM" (see [0101]), as one of no modulation, BPSK modulation, QPSK modulation, 8-PSK modulation, 16-QAM, 32-QAM, 64-QAM, 128-QAM and 256-QAM for each of the orthogonal frequency division multiplexed subcarriers.

-Regarding claim 14, Walton et al discloses a receiver (see figure 6) comprising:

FFT circuitry (614a,..., 614r) to generate frequency domain representations of a symbol received over orthogonal frequency division multiplexed subcarriers of a plurality of spatial channels (see [0123]);

subcarrier demodulators "DEMOD" (included in (630a,..., or 630n) to demodulate the frequency domain representations for each subcarrier in accordance with spatial-frequency subcarrier modulation assignments to generate groups of bits "demodulated data" (see [0125]); and

a deparser (inheretly included) to "multiplex", or namely combine, the groups of bits to generate a block of coded bits "channel data stream" representing the symbol (see [0125]).

-Regarding claim 15, Walton et al discloses that the FFT circuitry generates a frequency domain representation from each of the spatial channels (see [0123]), and wherein each orthogonal frequency division multiplexed subcarrier, as an OFDM symbol, inherently has a null at substantially a center frequency of the other subcarriers to achieve substantial orthogonality between the subcarriers.

-Claim 16 is rejected with similar reasons set forth for claim 3.

-Regarding claim 17, Walton et al discloses that wherein radio-frequency signals of the spatially channels can be received through a single antenna "one receive antenna" (see [0126]), and wherein the receiver comprises a device (620) (see figure 6) to separate signals of the spatial channels, (said device considered here equivalent with the limitation "beamformer" of performing a same function of separating signals of the spatial channels).

-Regarding claim 19, as similarly applied to claims 1-12, set forth above and herein incorporated, Walton et al discloses a method (see figure 3) comprising:

procedure (included in (320)) of parsing a block of bits representing an orthogonal frequency division multiplexed symbol into groups having a variable number of coded bits;

procedure (included in (320)) of individually modulating the groups of bits on orthogonal frequency division multiplexed subcarriers in accordance with spatial-frequency subcarrier modulation assignments to generate symbol-modulated subcarriers; and

procedure (320a,...,320t) of generating time domain waveforms by performing an inverse fast Fourier transform (IFFT) on the symbol-modulated subcarriers for subsequent RF transmission over a plurality of spatial channels.

-Regarding claim 20, as similarly applied to claim 2, Walton et al discloses procedure (112) of generating the orthogonal frequency division multiplexed subcarriers with a null at substantially a center frequency of the other subcarriers to achieve substantial orthogonality between the subcarriers; and procedure (114a,...,114t) transmitting the time domain waveforms over a corresponding one of the spatial channels, wherein the time domain waveforms together comprise the orthogonal frequency division multiplexed symbol (see figure 3).

-Claim 21 is rejected with similar reasons set forth for claim 3.

-Regarding claim 22, as similarly applied to claims 14-17, set forth above and herein incorporated, Walton et al discloses a method (see figure 6) comprising:

procedure (614a,..., 614r) of generating frequency domain representations of a symbol received over orthogonal frequency division multiplexed subcarriers over a plurality of spatial channels;

procedure "DEMOD" (included in (630a,..., or 630n) of demodulating the frequency domain representations for the subcarriers separately for each of the antennas in accordance with spatial-frequency subcarrier modulation assignments to generate groups of bits; and

procedure (inheretly included) of generating the symbol from a "multiplex" of the groups of bits.

-Claim 23 is rejected with similar reasons set forth for claim 15.

-Claim 24 is rejected with similar reasons set forth for claim 16.

-Regarding claim 25, as similarly applied to claims 1-13 and 14-17, set forth above and herein incorporated, Walton et al discloses a system (see figures 3 and 6) comprising: a plurality of substantially omnidirectional spatially-diverse transmit antennas (116a,..., 116t) (see figure 3) each antenna inherently has a directivity, (the antennas considered here equivalent with the limitation "substantially omnidirectional spatially-diverse transmit antennas"); and a transmitter, wherein the transmitter (see figure 3) comprises: a parser (included in (320)) to parse a block of bits representing a transmit orthogonal frequency division multiplexed symbol into groups; subcarrier modulators (included in (320)) to individually modulate the groups of bits on orthogonal frequency division multiplexed subcarriers in accordance with spatial-frequency subcarrier modulation assignments to generate symbol-modulated subcarriers; and IFFT circuitry

(320a,…,320t) to generate time domain waveforms from the symbol-modulated subcarriers for subsequent RF transmission by the spatially diverse transmit antennas.

-Regarding claim 26, Walton et al discloses that the system further comprises a receiver (see figure 6), wherein the receiver comprises: FFT circuitry (614a,…, 614r) to generate frequency domain representations of a receive orthogonal frequency division multiplexed symbol received over orthogonal frequency division multiplexed subcarriers by spatially diverse receive antennas; subcarrier demodulators "DEMOD" (included in (630a,..., or 630n)) to demodulate the frequency domain representations in accordance with receive channel spatial-frequency subcarrier modulation assignments to generate groups of bits; and a deparser (inheretly included) to "multiplex", or namely to combine, the groups of bits to generate a block of coded bits representing the receive orthogonal frequency division multiplexed symbol.

-Claim 27 is rejected with similar reasons set forth for claims 2 and 3.

-Regarding claim 28, as similarly applied to claims 1-13, 19-21 set forth above and herein incorporated, Walton et al discloses a method (see figure 3) comprising procedure (included in (320)) of parsing a block of bits representing an orthogonal frequency division multiplexed symbol into groups having a variable number of coded bits; procedure (included in (320)) of individually modulating the groups of bits on orthogonal frequency division multiplexed subcarriers in accordance with spatial-frequency subcarrier modulation assignments to generate symbol-modulated subcarriers; and procedure (320a,…,320t) of generating time domain waveforms by performing an inverse fast Fourier transform (IFFT) on the symbol-modulated subcarriers for subsequent RF transmission over a plurality of spatial channels.

Walton et al further teaches that the method can be performed by a "processor" when the processor executes instruction codes or software (see [0146]), which inherently are provided to the processor from a memory, (said processor considered here equivalent with the limitation "one or more processors, and the memory equivalent with " machine-readable medium").

-Claim 29 is rejected with similar reasons set forth for claim 20.

-Claim 30 is rejected with similar reasons set forth for claim 21.

Allowable Subject Matter

3. Claims 13 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuong Phu whose telephone number is 571-272-3009. The examiner can normally be reached on M-F (8:00 AM - 4:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Phuong Phu
Primary Examiner
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11/11/07

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